PATENT ABSTRACTS OF JAPAN

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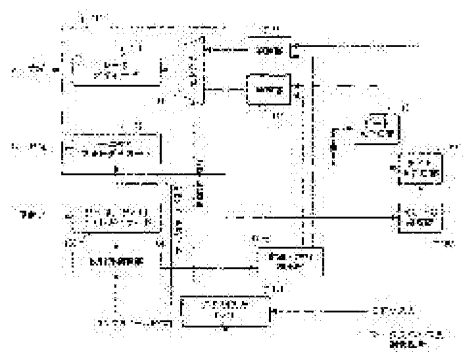
(54) **OPTICAL DISK RECORDER**

(57)Abstract:

PROBLEM TO BE SOLVED: To control the intensity of a laser beam for recording to be emitted in recording data to a recordable optical disk and the intensity of the laser beam for tracking focus control so as to follow stains such as fingerprints stuck to an optical disk recording surface and so as not to follow a recording surface shake or the like.

SOLUTION: In a conventional recording power correcting device adaptive to fingerprints and the stains, in order to improve fingerprint and stain detection accuracy, an EFM input interface for receiving space length selection signals, selecting the space length of EFM signals and generating sample-and-hold signals, constitution of correcting write power to a mark generated by a write APC part at the time of fingerprint and stain detection, and an addition part for correcting read power to a space generated by a read APC part at the time of the fingerprint and stain detection are provided.



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CLAIMS

[Claim(s)]
[Claim 1]
An optical disk unit provided with a laser beam irradiation means by irradiating with the 1st laser beam characterized by comprising the following that forms a pit on an optical disc based on data to record, and the 2nd laser beam that does not form a pit.
A light-receiving means to receive catoptric light of said 1st [the] and the 2nd laser beam with which the above-mentioned optical disc was irradiated, and to output a reflected-light-intensity signal according to intensity of said catoptric light.
A pit reflected light detection means which outputs the 1st signal with which reflected light intensity of a pit is expressed according to a reflected-light-intensity signal of said 1st laser beam.
A track detection means to output the 2nd signal showing whether a reflected-light-intensity signal of said 2nd laser beam is irradiated on a track groove of said optical disc.
A fingerprint and a dirt detection means which outputs the 3rd signal when said 2nd signal is beyond a predetermined threshold, A record power correction means to output a control signal for controlling irradiation intensity of said 1st [the] and the 2nd laser beam according to a level of said 1st signal to said laser beam irradiation means when the 3rd signal of the above is outputted.

[Claim 2]
The optical disk recording device according to claim 1, wherein said control signal amends a current value which flows into the said 1st or 2nd laser beam irradiation means according to a level of said first signal.
[Claim 3]
The optical disk recording device according to any one of claims 1 to 2, wherein a reflected-light-intensity acquisition means for generating said 2nd signal is what acquires reflected light intensity of a pit sheep formation signal set up beforehand.
[Claim 4]
The 1st light emitting device to which said laser beam irradiation means irradiates with the 2nd laser beam on a track groove of an optical disc, Have the 2nd light emitting device that irradiates with the 2nd laser beam between track grooves of an optical disc, and the above-mentioned light-receiving means, The 1st photo detector that outputs a reflected-light-intensity signal which receives catoptric light of an optical disc produced by said 1st light emitting device, and with which the light intensity is expressed, Have the 2nd photo detector that outputs a reflected-light-intensity signal which receives catoptric light of an optical disc produced by said 2nd light emitting device, and with which the light intensity is expressed, and the above-mentioned track detection means, The optical disk recording device according to any one of claims 1 to 3 characterized by being what outputs said 2nd signal based on a reflected-light-intensity signal which said 1st photo detector outputs, and a

reflected-light-intensity signal which said 2nd photo detector outputs.
[Claim 5]
The optical disk recording device according to any one of claims 1 to 4 being what holds uniformly irradiation intensity of said 1st [the] and the 2nd laser beam while having the following and not outputting said 3rd signal.
A photo detector for a monitor which said laser beam irradiation means receives said 1st [the] and the 2nd laser beam, and outputs the light intensity signal which a **** degree expresses.
A control circuit which controls irradiation intensity of said 1st [the] and the 2nd laser beam in response to said light intensity signal.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]
This invention relates to the device which records a data signal on the optical disc in which a postscript and rewriting are possible stably.
[0002]
[Description of the Prior Art]
When recording a data signal on write once optical disks, such as CD-R (Orange Book standard), generally, the parity for an error correction is added to a data signal, and the signal modulated by the EFM method is further used in the signal. Nine kinds of time width 3T-11T produced by increasing predetermined base period width T 11 times from 3 as time width of the high level of a signal or a low level is given to this modulated signal. Based on this signal, when a signal is high-level, a write once optical disk is irradiated with a pulse form laser beam, and a pit is formed in the recording layer of this write once optical disk. Thereby, a data signal is recorded on a write once optical disk.
[0003]
In performing the above-mentioned signal record, before irradiating the recording layer of a write once optical disk with a laser beam, it performs recording laser beam intensity optimization (it carries out the following "OPC".). Generally, the write once optical disk has the power calibration area (it carries out the following "PCA".) for performing OPC. PCA consists of a test area and a count area, it has 100 partitions, respectively, and one partition of a test area has 15 frames.
[0004]
OPC records a predetermined signal on above-mentioned PCA, and is performed by reproducing the record signal. For example, pit formation is performed using 15 steps of laser beam intensity by 15 inter-frame, laser beam intensity with the most sufficient recorded state is detected in it, and the method of recording a data signal with the laser beam intensity is known.
[0005]
In the state where the data signal is recorded on the recording layer of a write once optical disk, running OPC (it carries out the following "ROPC".) is performed. ROPC amends the laser beam intensity which irradiates with the reflected light intensity of a pit with the time of the above-mentioned OPC and data signal record based on the result at any time in order to hold uniformly the optimal laser beam intensity obtained by the above OPC among a data signal recorded state. The pit used in order to detect reflected light intensity has the time width 11T.
The reflected light intensity of the pit back end is used.
This reflected light intensity is called B value.
[0006]
Drawing 3 is a block diagram for explaining the conventional record power correction device. This

composition is JP,2000-222730,A etc. and is already known. This computes B value from the catoptric light of the laser beam for record with which the write once optical disk was irradiated, and controls the irradiation intensity of this laser beam based on these B values.

[0007]

In order that the above-mentioned record power correction device may monitor the semiconductor laser diode 101 which irradiates a write once optical disk with the object for record, or the laser beam for playback, and the irradiation intensity of the above-mentioned laser beam, The photo-diode 102 for a monitor which receives this a part of laser beam, and outputs the electrical signal corresponding to the light intensity, The lead APC section 108 and the light APC section 109 which control the light intensity which undergoes this output, and with which the semiconductor laser diode 101 irradiates, The servo / photo-diode 103 for RF which receives the catoptric light from the write once optical disk produced by the above-mentioned laser beam, and outputs the electrical signal corresponding to the reflected light intensity, The catoptric light operation part 104 which generates various signals (a DRC signal, tracking, a focusing signal, B value signal) based on this reflected-light-intensity signal, The EFM input interface 105 which generates the catoptric light range (prescribed period of a pit recording part or a pit sheep recording part) which this catoptric light operation part 104 should calculate based on an EFM signal, During the ROPC treating part 107 which sets up a gain based on these B values, the fingerprint and dirt primary detecting element 112 which receive said DRC signal, detect a fingerprint, dirt, etc., and control optimum light power, and detecting periods, such as a fingerprint and dirt, The adder unit 110 which adds prescribed power to the usual light power, the light power of this adder unit 110 output, and the read power of lead APC section 108 output, It is ** constituted with the selector 111 chosen in the pit formation (it carries out the following "mark".) period of a record EFM signal, and pit the period unformed (it is hereafter considered as a "space".). The laser diode 101, the photo-diode 102 for a monitor, and the selector 111 are summarized, and, generally it is called the pickup 100.

[0008]

Hereafter, operation of the above-mentioned record power correction device is explained. The laser diode 101 irradiates a write once optical disk with the laser beam for record of the optimal light intensity obtained by OPC. According to the sample holding signal which the EFM input interface 105 outputs, the photo-diode 102 for a monitor, This a part of laser beam is divided into a space period and a mark period, sample hold is carried out, the intensity of each period is changed into an electrical signal, and it outputs to lead APC section 108 and light (signal of mark period) APC109, respectively (signal of a space period). The lead APC section 108 receives the output value of a space period among these outputs, and it controls it so that the laser diode 101 becomes constant [the laser beam of the optimum strength] in a space period. The light APC section 109 receives the output value of a mark period among these outputs, and it controls it so that the laser diode 101 becomes constant [the laser beam of the optimum strength] in a mark period.

[0009]

A servo / photo-diode 103 for RF receives the catoptric light from the write once optical disk produced by the laser beam for record, changes the reflected light intensity into an electrical signal, and outputs it. According to the sample holding signal which the EFM input interface 105 generates, the catoptric light operation part 104 carries out sample hold of the catoptric light, performs prescribed operation based on this sample holding signal, and outputs a DRC signal and B value signal. The ROPC treating part 107 outputs a gain based on the difference of these B values and a desired value. The light APC section 109 updates the desired value of the light intensity of the laser beam for record based on this gain. Thereby, the laser beam intensity for record irradiated from the above-mentioned laser diode 101 is controlled so that B value turns into a predetermined desired value.

[0010]

A fingerprint and the dirt primary detecting element 112 observe said DRC signal, and detects a

fingerprint, dirt, etc. Only in this detecting period, the adder unit 110 adds the prescribed power which a fingerprint and the dirt primary detecting element 112 output to the usual optimum light power which the light APC section 109 outputs, and outputs it to the pickup 100 as the last light power so that proper record may be attained.

[0011]

Thus, since according to the above-mentioned conventional record power correction device the laser beam intensity for record irradiated from the laser diode 101 is controlled so that B value detected from the catoptric light of a write once optical disk always turns into a desired value, Change of the laser beam intensity according to the temperature change of a semiconductor laser diode to the inside of the data signal recorded state in a write once optical disk, Also in the state of being able to perform laser power control which followed these, and recording the part of a fingerprint, dirt, etc. also when factors, such as a shape change of a write once optical disk or recording sensitivity change of this disk recording layer, arise, Since this fingerprint and dirt are detected and light power of a mark period is changed temporarily, stable data recording can be performed.

[0012]

[Problem(s) to be Solved by the Invention]

Usually, since dirt, such as a fingerprint, is about tens of [several to] mm in size, when linear velocity by which a write once optical disk is traced is made into 1.2 m/s, time for 1 mm of dirt to influence is about 0.83 ms. In the case of a conventional example, in the mark portion which should be recorded, since record power is temporarily changed corresponding to such a fingerprint, dirt, etc., record power is controlled good, but. In order to confuse the catoptric light of this space portion under the influence of the fingerprint, dirt, etc. of a space portion, the tracking/focus control to which control is carried out based on this catoptric light are confused, and the problem on which the beam spot of a tracking gap or a laser beam will be recorded in the unsuitable state arises.

[0013]

As shown in drawing 8, catoptric light in case there are not a fingerprint, dirt, etc. to the record EFM signal of drawing 8 (a) is drawing 8 (b), and catoptric light in case there are a fingerprint and dirt like the shadow area 801 of drawing 8 (e) is drawing 8 (f). In a part with a fingerprint and dirt, catoptric light is confused also in the space period to which not only mark recording periods but light power is not applied so that drawing 8 (f) may see.

[0014]

Thus, since the catoptric light of this space portion is confused under the influence of the fingerprint, dirt, etc. of a space portion, the tracking/focus control to which control is carried out based on this catoptric light are confused, the beam spot of a tracking gap or a laser beam will be in an unsuitable state, and a recorded state will become unstable.

[0015]

In light of the above-mentioned problems, this invention is a thing.

Also in [in addition to the laser beam intensity for lights to the mark portion which irradiates with the purpose at the time of the data recording through which it passes] the laser beam intensity for a lead to a space portion, It is that control to follow dirt, such as a fingerprint adhering to an optical disc surface, and not to follow to recording surface blur etc., and this provides the record power correction device which can make the data recording state to an optical disc always the optimal and stable.

[0016]

[Means for Solving the Problem]

In order that an optical disk recording device of this invention may raise a fingerprint and dirt detecting accuracy, Receive a mark space length selection signal, choose mark length or space length of an EFM signal, and A sample holding signal, And an EFM interface for generating a power selection signal to a laser diode, By and a thing for which it has an adder unit which amends read

power to a space of the lead APC section generation at the time of a fingerprint and dirt detection in addition to composition which amends light power to a mark of the light APC section generation at the time of a fingerprint and dirt detection. A fingerprint etc. can be detected with high precision, without being influenced by a laser beam output or disk reflectance, and a data recording state to an optical disc can always be made the optimal.

[0017]

[Embodiment of the Invention]

In the optical disk unit provided with the laser beam irradiation means when the invention according to claim 1 irradiated with the 1st laser beam that forms a pit on an optical disc based on the data to record, and the 2nd laser beam that does not form a pit, A light-receiving means to receive the catoptric light of said 1st [the] and the 2nd laser beam with which the above-mentioned optical disc was irradiated, and to output the reflected-light-intensity signal according to the intensity of said catoptric light, The pit reflected light detection means which outputs the 1st signal with which the reflected light intensity of a pit is expressed according to the reflected-light-intensity signal of said 1st laser beam, A track detection means to output the 2nd signal showing whether the reflected-light-intensity signal of said 2nd laser beam is irradiated on the track groove of said optical disc, The fingerprint and dirt detection means which outputs the 3rd signal when said 2nd signal is beyond a predetermined threshold, It is an optical disk recording device having a record power correction means to output the control signal for controlling the irradiation intensity of said 1st [the] and the 2nd laser beam according to the level of said 1st signal to said laser beam irradiation means when the 3rd signal of the above is outputted, Since power control can be performed according to the fingerprint and dirt on an optical disc also to the irradiation intensity of not only the 1st laser beam but the 2nd laser beam, The tracking in a part and control of a focus with said fingerprint and dirt can be performed correctly.

[0018]

The invention according to claim 2 is the optical disk recording device according to claim 1 amending the current value through which said control signal flows into the said 1st or 2nd laser beam irradiation means according to the level of said first signal, Since power control can be performed according to the fingerprint and dirt on an optical disc also to the irradiation intensity of not only the 1st laser beam but the 2nd laser beam, the tracking in a part and control of a focus with said fingerprint and dirt can be performed correctly.

[0019]

The reflected-light-intensity acquisition means for generating said 2nd signal the invention according to claim 3, It is the optical disk recording device according to any one of claims 1 to 2 being what acquires the reflected light intensity of the pit sheep formation signal set up beforehand, Since power control can be performed according to the fingerprint and dirt on an optical disc also to the irradiation intensity of not only the 1st laser beam but the 2nd laser beam, the tracking in a part and control of a focus with said fingerprint and dirt can be performed correctly.

[0020]

The invention according to claim 4 said laser beam irradiation means, Have the 1st light emitting device that irradiates with the 2nd laser beam on the track groove of an optical disc, and the 2nd light emitting device that irradiates with the 2nd laser beam between the track grooves of an optical disc, and the above-mentioned light-receiving means, The 1st photo detector that outputs the reflected-light-intensity signal which receives the catoptric light of the optical disc produced by said 1st light emitting device, and with which the light intensity is expressed, Have the 2nd photo detector that outputs the reflected-light-intensity signal which receives the catoptric light of the optical disc produced by said 2nd light emitting device, and with which the light intensity is expressed, and the above-mentioned track detection means, Based on the reflected-light-intensity signal which said 1st photo detector outputs, and the reflected-light-intensity signal which said 2nd photo detector outputs, It is the optical disk recording device according to any one of claims 1 to 3

being what outputs said 2nd signal, Since power control can be performed according to the fingerprint and dirt on an optical disc also to the irradiation intensity of not only the 1st laser beam but the 2nd laser beam, the tracking in a part and control of a focus with said fingerprint and dirt can be performed correctly.

[0021]

The invention according to claim 5 said laser beam irradiation means, The photo detector for a monitor which receives said 1st [the] and the 2nd laser beam, and outputs the light intensity signal which a **** degree expresses, While having said 1st [the] and a control circuit which controls the irradiation intensity of the 2nd laser beam in response to said light intensity signal and not outputting said 3rd signal, It is the optical disk recording device according to any one of claims 1 to 4 being what holds uniformly the irradiation intensity of said 1st [the] and the 2nd laser beam, Since power control can be performed according to the fingerprint and dirt on an optical disc also to the irradiation intensity of not only the 1st laser beam but the 2nd laser beam, the tracking in a part and control of a focus with said fingerprint and dirt can be performed correctly.

[0022]

(Embodiment 1)

Drawing 1 is a block diagram showing the composition of the record power correction device of the embodiment of the invention 1. The record power correction device of a figure is provided with the laser diode 101 which irradiates with the 1st laser beam that is the light intensity which forms a pit in a write once optical disk, and the 2nd laser beam that is the light intensity which does not form a pit, and is connected with the optical disk unit (not shown).

[0023]

The photo-diode 102 for a monitor which outputs the electrical signal with which the above-mentioned record power correction device receives a part of 1st laser beam of the above, and light intensity is expressed, The light APC section 109 controlled so that the 1st laser beam intensity that receives this electrical signal, and with which the semiconductor laser diode 101 irradiates holds a desired value, The lead APC section 108 controlled so that the 2nd laser beam intensity with which the laser diode 101 similarly irradiates holds a desired value, The servo / photo-diode 103 for RF which outputs the electrical signal which receives the catoptric light from the write once optical disk produced by the object for record, or the 2nd laser beam, and with which this reflected light intensity is expressed, The catoptric light operation part 104 which generates various signals (a DRC signal, tracking/focus error signal, B value signal) based on this reflected-light-intensity signal, The EFM input interface 151 which generates the catoptric light range (prescribed period of a mark portion or a space portion) which this catoptric light operation part 104 should calculate based on an EFM signal, During the ROPC treating part 107 which sets up a gain based on these B values, the fingerprint and dirt primary detecting element 112 which receive said DRC signal, detect a fingerprint, dirt, etc., and control optimum light power and the optimal read power, and detecting periods, such as a fingerprint and dirt, The adder unit 110 which adds prescribed power to the usual light power, and the adder unit 152 which adds prescribed power to the usual read power during detecting periods, such as a fingerprint and dirt, It is ** constituted with the selector 111 which chooses the light power of this adder unit 110 output, and the read power of this adder unit 152 output in the mark period and space period of a record EFM signal. As usual, the laser diode 101, the photo-diode 102 for a monitor, and the selector 111 are summarized, and, generally it is called the pickup 100. Hereafter, the detailed composition of the above-mentioned record power correction device is explained.

[0024]

Drawing 4 is a servo / photo-diode 103 for RF, and a figure showing the composition of the catoptric light operation part 104, and is for generating the above-mentioned DRC signal, B value signal, a track error signal, and a focus error signal. In the figure, Tr is a track groove of a write once optical disk, and sub beam Sb1 for detecting the main beam Mb which irradiates with the object for record

or the 2nd laser beam, and a track or a focal error, and Sb2 are irradiated by this track groove Tr. The main beam Mb, sub beam Sb1, and Sb2 are arranged so that the irradiation position may become that from which only the half of the width between track grooves shifted. Namely, the irradiation position of the main beam Mb in the center of the track groove Tr. The irradiation position of sub beam Sb1 between the track grooves by the side of the end of the track groove Tr, The servo / photo-diode 103 for RF arranged so that the irradiation position of sub beam Sb2 may come between the track grooves by the side of the other end of the track groove Tr, The photo-diode for main beams (A, B, C, D) which outputs the electrical signal which receives the catoptric light of the main beam Mb, and with which the light intensity is expressed, The catoptric light of sub beam Sb1 was received, and the photo-diode for sub beams (E, F) which outputs the electrical signal showing the light intensity, and the catoptric light of sub beam Sb2 were received, and it has the photo-diode for sub beams (G, H) which outputs the electrical signal showing the light intensity.

[0025]

The above-mentioned photo-diode for main beams is a quadrisection photo-diode, and outputs the signal A, B, and C and D based on the light intensity which each received. On the other hand, two photo-diodes for sub beams are 2 division photo-diodes respectively, and output the signals G and H for the signals E and F based on the catoptric light of sub beam Sb2 based on the catoptric light of sub beam Sb1.

[0026]

The sample hold circuit 41a where the catoptric light operation part 104 holds the signal A, The sample hold circuit 41b holding the signal B, and the sample hold circuit 41c holding the signal C, 41 d of sample hold circuits holding the signal D, and the sample hold circuit 41e holding the signals E and G, The adding machine 42a adding 41 f of sample hold circuits holding the signals F and H, and the output of the sample hold circuit 41a and the output of the sample hold circuit 41b, The adding machine 42b adding the output of the sample hold circuit 41c, and the output of 41 d of sample hold circuits, The adding machine 42c adding the output of the sample hold circuit 41b, and the output of the sample hold circuit 41c, The adding machine 42d adding the output of the sample hold circuit 41b, and the output of 41 d of sample hold circuits, The adding machine 42e adding the output of the adding machine 42a, and the output of the adding machine 42b, The subtractor 43c which subtracts the subtractor 43b which subtracts the subtractor 43a which subtracts the output of the adding machine 42c, and the output of the adding machine 42d, and the output of the adding machine 42a and the output of the adding machine 42b, and the output of the sample hold circuit 41e and the output of 41 f of sample hold circuits, The adding machine 42f adding the output of the sample hold circuit 41e, and the output of 41 f of sample hold circuits, It has the subtractor 43e which subtracts the subtractor 43d which subtracts the amplifying circuit 44 which amplifies ****** of the adding machine 42f, the amplifying circuit 45 which amplifies the output of the subtractor 43c, and the output of the adding machine 42e and the output of the amplifying circuit 44, and the output of the subtractor 43b and the output of the amplifying circuit 45.

[0027]

As for a subtractor 43d output and a track error signal, a subtractor 43e output and the focus error signal of a DRC signal are subtractor 43a outputs here. On the other hand, said B value signal is a signal which held adding machine 46 output adding each output signal A, B, and C of the photo-diode for main beams, and D in the sample hold circuit 47.

[0028]

A DRC signal deducts the reflected light quantity of the sub beams Sb1 and Sb2 from the reflected light quantity of the main beam Mb. Usually, since sub beam Sb1 and Sb2 have little light volume compared with the main beam Mb, they are amplifying the electrical signal P times in the amplifying circuit 44. P is computed from the light volume ratio of the main beam Mb, sub beam Sb1, and Sb2.

[0029]

When the reflectance of the field which is irradiating with the main beam Mb, and the reflectance of

the field which is irradiating with sub beam Sb1 and Sb2 are equal, the above-mentioned DRC signal serves as zero. When the reflectance of the field which is irradiating with the main beam Mb is smaller, a DRC signal serves as negative, and when the reflectance of the field which is irradiating with sub beam Sb1 and Sb2 is smaller conversely, a DRC signal serves as positive. Usually, let the irradiation position of the main beam Mb, and the irradiation position of sub beam Sb1 and Sb2 be the positions which shifted only the track groove half. Therefore, when the main beam Mb is on the track groove Tr (one track), Sub beam Sb1 and Sb2 may be located between the track groove Tr and the track groove (off-track) contiguous to the track groove Tr, the main beam Mb may be in sub beam Sb1 offtrack conversely, and Sb2 is on an one track. In an optical disc, since the reflectance of an one track is small compared with offtrack reflectance, the off-track / one track of the main beam Mb can be distinguished by right/negative one of a DRC signal.

[0030]

Next, a fingerprint and the dirt primary detecting element 112 have the following.

The window comparator which outputs a DRC party rate signal when a DRC signal is considered as an input and this DRC signal exceeds a predetermined threshold.

The one-shot multivibrator which removes and outputs Lo pulse below predetermined time from this DRC party rate signal.

[0031]

The figure for explaining detection of dirt, such as a fingerprint by a DRC signal, is shown in drawing 5. In drawing 5 (a), 501 is an optical disc and expresses the section of this optical disc 501. 502 controls the focus of the laser beam which it is an object lens and is irradiated by the optical disc 501. Shadow areas are dirt, such as a fingerprint adhering to the optical disc 501.

[0032]

A DRC signal is sharply changed in the position where drawing 5 (b) shows said DRC signal and which has dirt, such as a fingerprint. Since dirt, such as a fingerprint, is not usually optically uniform, the reflected light quantity of a main beam and the reflected light quantity of a sub beam are sharply changed with this dirt. Therefore, the DRC signal which is a relative value of the reflected light quantity of a main beam and the reflected light quantity of a sub beam is changed at random, as shown in drawing 5 (b).

[0033]

Said window comparator detects change of the above-mentioned DRC signal. Since it is somewhat changed also by the noise produced by the unevenness and the electric circuit of reflectance of an optical disc, a DRC signal sets up a predetermined threshold beforehand, and when a DRC signal exceeds this threshold, it outputs a DRC party rate signal (drawing 5 (c)).

[0034]

Said one-shot multivibrator removes the signal below a predetermined pulse from the above-mentioned DRC party rate signal, and outputs a fingerprint detecting signal (drawing 5 (d)). For example, since time to pass this dirt will be set to 0.83 ms if the size of the dirt which should detect the linear velocity which traces an optical disc 1.2 m/s shall be 1 mm, the pulse for 0.83 or less ms is removed.

[0035]

Drawing 6 is a block diagram showing the composition of the above-mentioned lead APC section 108. The read power desired value storage 601 in which this lead APC section 108 holds target space reading power in a figure, It has the APC loop filter 603 and ** which control the output of the subtractor 602 which subtracts the output of this read power desired value storage 601, and the output of the photo-diode 102 for a monitor of a space period, and this subtractor 602 by a predetermined frequency characteristic.

[0036]

Drawing 7 is a block diagram showing the composition of the above-mentioned light APC section

109 and the ROPC treating part 107. The light power desired value storage 701 in which this light APC section 109 holds target mark record power in a figure, The adding machine 704 adding the output of this light power desired value storage 701, and the output of the ROPC loop filter 713, The subtractor 702 which subtracts the output of this adding machine 704, and the output of the photo-diode 102 for a monitor at the time of mark record, It has the adding machine 705 adding the APC loop filter 703 which controls the output of this subtractor 702 by a predetermined frequency characteristic, and the output of this APC loop filter 703 and the output of the recording current amendment part 714.

[0037]

The above-mentioned ROPC treating part 107 is provided with the following.

B value desired value storage 712 holding B value made into a target.

The subtractor 711 which subtracts B value of the output of this B value desired value storage 712, and catoptric light operation part 104 output.

The ROPC loop filter 713 controlled by a predetermined frequency characteristic.

The recording current amendment part 714 which amends recording current based on the output of this ROPC loop filter 713.

[0038]

Here the above-mentioned APC loop filter and a ROPC loop filter, As a primary general IIR digital filter, After carrying out the multiplication of the predetermined coefficient and amplifying it to a sample input value, there is an example which outputs an added result with the value which carried out the multiplication of the predetermined coefficient to the memory value memorized by the portion memorized to a storage cell, the amplification value which amplified the present sample input value, and this storage cell, and amplified it to it.

[0039]

Drawing 2 is a block diagram showing the composition of the EFM input interface 151. In a record EFM signal, this EFM input interface 151 A DRC signal, . [to which space length a track error signal and the sample holding signal over the sample hold circuits 41a-41f which become the origin of focus error signal generation are generated, and] . [to which mark length the sample holding signal over the sample hold circuit 47 which becomes the origin of B value signal generation is generated, and] . [to which mark length or space length when the photo-diode 102 for a monitor carries out sample hold of each laser monitor signal of a mark period and a space period, a sample holding signal is generated, and] The point of receiving a ****** mark space length selection signal, and carrying out the generation output of the required sample holding signal is a different point from a conventional example.

[0040]

Composition and operation are explained. The EFM width counter 201 observes the EFM signal input from the outside, counts the length of each mark with a recording clock (let 1T be a cycle), and passes this counted value to the mark width storage parts store 202. The length of each space is similarly counted with a recording clock, and this counted value is passed to the space width storage parts store 203. The mark width storage parts store 202 and the space width storage parts store 203, It both comprises a FIFO storage cell of the number of specified stages, and the Marks pace Observations Department 205 observes each mark length and space length whom this mark width storage parts store 202 and the space width storage parts store 203 are indicating, and generates an internal EFM signal again. This internal EFM signal is sent to the record EFM generation part 204 and the sample holding signal generation part 206, and the record EFM generation part 204, Carry out the generation output of the record EFM signal which shaped this internal EFM signal in waveform to specified shape, and was suitable for record, and the sample holding signal generation part 206, Only the mark portion specified with said mark space length selection signal among these internal EFM signals or a space portion is chosen, and it shapes in waveform to specified shape, and

outputs as a sample holding signal.

[0041]

Said record EFM signal functions as a select signal of the selector 111, and this selector 111, When the optimum light power of adder unit 110 output is sent to the laser diode 101 when this record EFM signal shows a mark period, and a space period is shown, the optimal read power of adder unit 152 output is sent to the laser diode 101.

[0042]

Since this EFM input interface 151 can choose the part of required mark length or space length in said various sample holding signal generation, For example, the thing which was generating the sample holding signal of only the space between 11T conventionally, It becomes possible to generate the sample holding signal of the space of 6T-11T, It has the effect that the accuracy of the fingerprint and dirt detection which it became generable, and the time resolution of said DRC signal, the track error signal, the focus error signal, and B value signal increased by extension, for example, carried out the sample holding signal of high resolution based on the DRC signal at the time of speed recording improves.

[0043]

Next, operation is explained. The laser diode 101 irradiates a write once optical disk with the laser beam for record of the optimal light intensity obtained by OPC. According to the sample holding signal which the EFM input interface 105 outputs, the photo-diode 102 for a monitor, This a part of laser beam is divided into a space period and a mark period, sample hold is carried out, the intensity of each period is changed into an electrical signal, and it outputs to lead APC section 108 and light (signal of mark period) APC109, respectively (signal of a space period). The lead APC section 108 receives the output value of a space period among these outputs, and it controls it so that the laser diode 101 becomes constant [the laser beam of the optimum strength] in a space period. The light APC section 109 receives the output value of a mark period among these outputs, and it controls it so that the laser diode 101 becomes constant [the laser beam of the optimum strength] in a mark period.

[0044]

A servo / photo-diode 103 for RF receives the catoptric light from the write once optical disk produced by the laser beam for record, changes the reflected light intensity into an electrical signal, and outputs it. According to the sample holding signal which the EFM input interface 105 generates, the catoptric light operation part 104 carries out sample hold of the catoptric light, performs prescribed operation based on this sample holding signal, and outputs a DRC signal and B value signal. The ROPC treating part 107 outputs a gain based on the difference of these B values and a desired value. The light APC section 109 updates the desired value of the light intensity of the laser beam for record based on this gain. Thereby, the laser beam intensity for record irradiated from the above-mentioned laser diode 101 is controlled so that B value turns into a predetermined desired value.

[0045]

A fingerprint and the dirt primary detecting element 112 observe said DRC signal, and detects a fingerprint, dirt, etc. Only in this detecting period, the adder unit 110 adds the prescribed power which a fingerprint and the dirt primary detecting element 112 output to the usual optimum light power which the light APC section 109 outputs, and outputs it to the pickup 100 as the last light power so that proper record may be attained. Only in this detecting period, the adder unit 152 the catoptric light of a proper space period so that it may become acquirable, The prescribed power which a fingerprint and the dirt primary detecting element 112 output is added to the usual optimal read power which the lead APC section 108 outputs, and it outputs to the pickup 100 as the last read power.

[0046]

Drawing 8 is a figure for explaining the details of the above-mentioned sample hold. Drawing 8 (a)

shows the optical power waveform of the laser beam irradiated by the write once optical disk, and the semiconductor laser diode 101 irradiates with it based on the record EFM signal which should be recorded on an optical disc. The section when the main beam Mb forms a mark in the recording layer of a disk irradiates with the 1st laser beam that is strong optical power, and the section which does not form a mark is irradiating with the 2nd laser beam that is a taper output. Drawing 8 (b) shows the waveform of disk reflected light, its reflected light intensity is high at the starting point side of a mark, it becomes low after that gradually, and is converged on constant value near the termination side. Since the pit where this is formed in a write once optical disk is gradually formed after it receives a laser beam, it is for according to the fall of the catoptric light by this pit also taking place gradually. Therefore, in order for a catoptric light level to converge on constant value, the termination side of a pit does not converge the catoptric light level from a short pit like the pit which needs to be a pit long enough like the pit of the time width 11T, for example, is the time width 3T, for example, either. This convergent catoptric light level is B value, and B value changes corresponding to the laser beam intensity irradiated for pit formation. By controlling laser beam intensity so that B value turns into optimal value, the recorded state to a write once optical disk can be made the optimal.

[0047]

Drawing 8 (c) shows the sample hold circuit control signal of a space period, serves as Hi in the section when the 2nd laser beam is irradiated, serves as Lo in the section when the 1st laser beam is irradiated, and holds the disk reflected light (drawing 8 (b)) of a space period. The position to which a sample hold circuit control signal changes from Lo to Hi has provided delay a little from the position in which a laser beam changes, in order not to carry out the sample of the response (R1, R2, R3) of the disk reflected light (drawing 8 (b)) produced at the time of the transition to the 2nd laser beam from the 1st laser beam. Thus, sample hold of the disk reflected light when the 2nd laser beam (space period) is irradiated is carried out.

[0048]

Drawing 8 (b) is an output wave of the adding machine 46, and the sample hold circuit 47, A long mark, for example, time width, carries out sample hold of the B value of a waveform rear end part in the mark beyond 6T by performing a sample after fixed time progress, for example, time 5T progress, from a waveform leader among these output waves (drawing 8 (d)).

[0049]

Catoptric light in case there are a fingerprint and dirt like the shadow area 801 of drawing 8 (e) is drawing 8 (f). In a part with a fingerprint and dirt, catoptric light is confused also in the space period to which not only mark recording periods but light power is not applied so that drawing 8 (f) may see. In order to remove the influence of disorder of the catoptric light in this space period, in the adder unit 152, the prescribed power value of a fingerprint and dirt primary detecting element 112 output is added to the usual read power of lead APC108 output. By this processing, the catoptric light of a space period is stabilized and becomes removable about the adverse effect to a tracking error signal or a focus error signal.

[0050]

[Effect of the Invention]

According to the record power correction device concerning this invention, to an optical disc during record, A fingerprint etc. are detected to high sensitivity and high degree of accuracy, without being influenced by a laser beam output or disk reflectance, The laser beam intensity with which it becomes possible to also perform control of tracking or a focus normally, and irradiates at the time of the data recording to an optical disc, It becomes controllable, without following dirt, such as a fingerprint adhering to a recording surface, and following recording surface blur, and the data recording state to an optical disc can be made always the optimal.

[Brief Description of the Drawings]

[Drawing 1]The block diagram showing the composition of the record power correction device in

the embodiment of the invention 1
[Drawing 2]The block diagram showing the composition of the EFM interface in the embodiment of the invention 1
[Drawing 3]The block diagram for explaining the conventional record power correction device
[Drawing 4]The figure showing the composition of the catoptric light operation part 104
[Drawing 5]The figure for explaining detection of dirt, such as a fingerprint by a DRC signal
[Drawing 6]The block diagram showing the composition of the lead APC section 108
[Drawing 7]The block diagram showing the composition of the light APC section 109 and the ROPC treating part 107
[Drawing 8]The figure showing the influence of the reflected light signal by dirt, such as details of sample hold, and a fingerprint
[Description of Notations]
41 a-f Sample hold section (S/H)
42 a-f Adding machine
43 a-e Subtractor
44 Amplifier
45 Amplifier
46 Adding machine
47 Sample hold section (S/H)
100 Pickup
101 Laser diode
102 The photo-diode for a monitor
103 A servo / photo-diode for RF
104 Catoptric light operation part
107 ROPC treating part
108 Lead APC section
109 Light APC section
110 Adder unit
111 Selector
112 A fingerprint and a dirt primary detecting element
151 EFM input interface
152 Adder unit
201 EFM width counter
202 Mark width storage parts store
203 Space width storage parts store
204 Record EFM generation part
205 Marks pace Observations Department
206 Sample holding signal generation part
501 Write once optical disk
502 Object lens
503 and 504 Threshold
601 Read power desired value storage
602 Subtractor
603 APC loop filter
701 Light power desired value storage
702 Subtractor
703 APC loop filter
704 and 705 Adding machine
711 Subtractor
712 B value desired value storage

713 ROPC loop filter
714 Recording current amendment part
801 (On a track) A fingerprint and dirt

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

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44 Amplifier
45 Amplifier
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104 Catoptric light operation part
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108 Lead APC section
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152 Adder unit
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202 Mark width storage parts store

203 Space width storage parts store
204 Record EFM generation part
205 Marks pace Observations Department
206 Sample holding signal generation part
501 Write once optical disk
502 Object lens
503 and 504 Threshold
601 Read power desired value storage
602 Subtractor
603 APC loop filter
701 Light power desired value storage
702 Subtractor
703 APC loop filter
704 and 705 Adding machine
711 Subtractor
712 B value desired value storage
713 ROPC loop filter
714 Recording current amendment part
801 (On a track) A fingerprint and dirt

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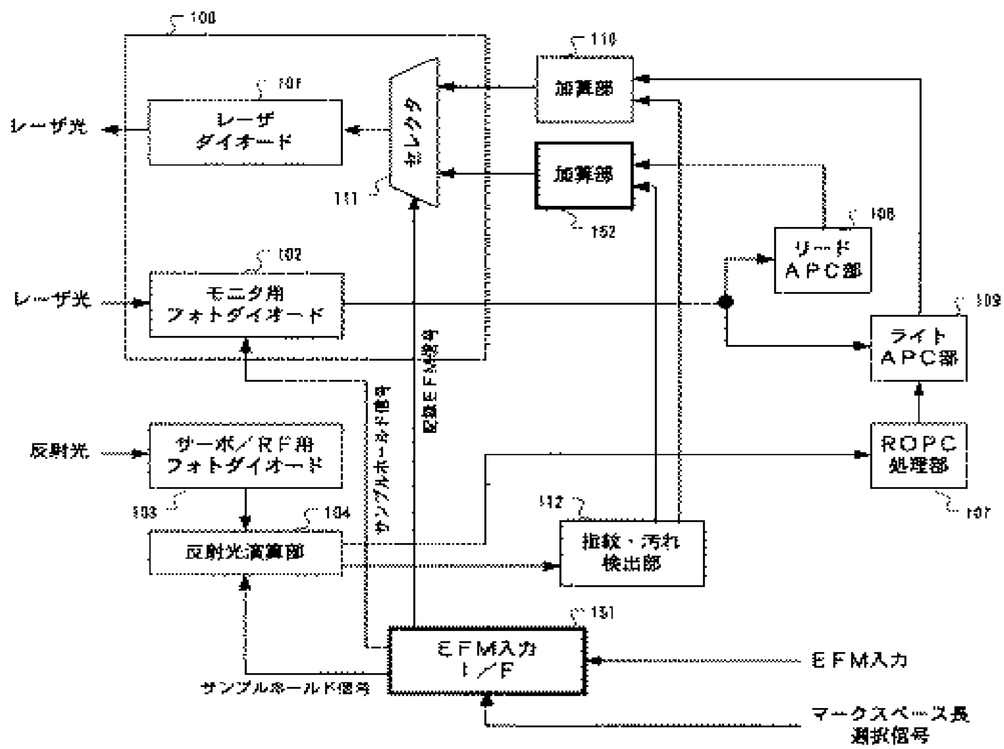
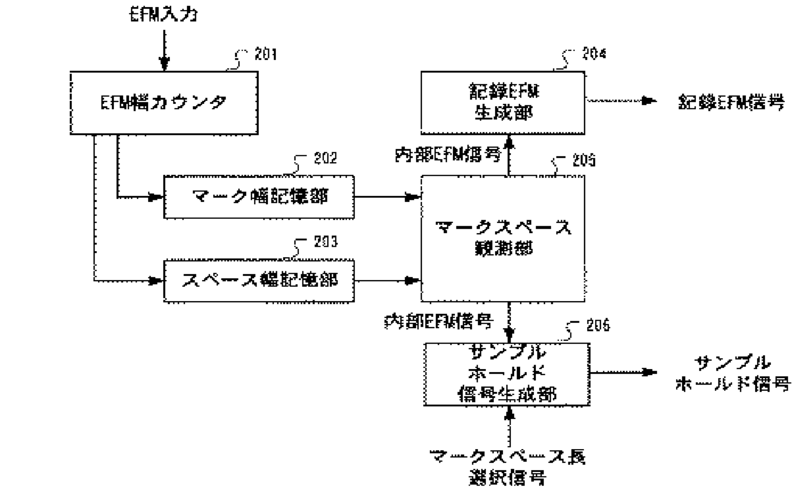
DRAWINGS

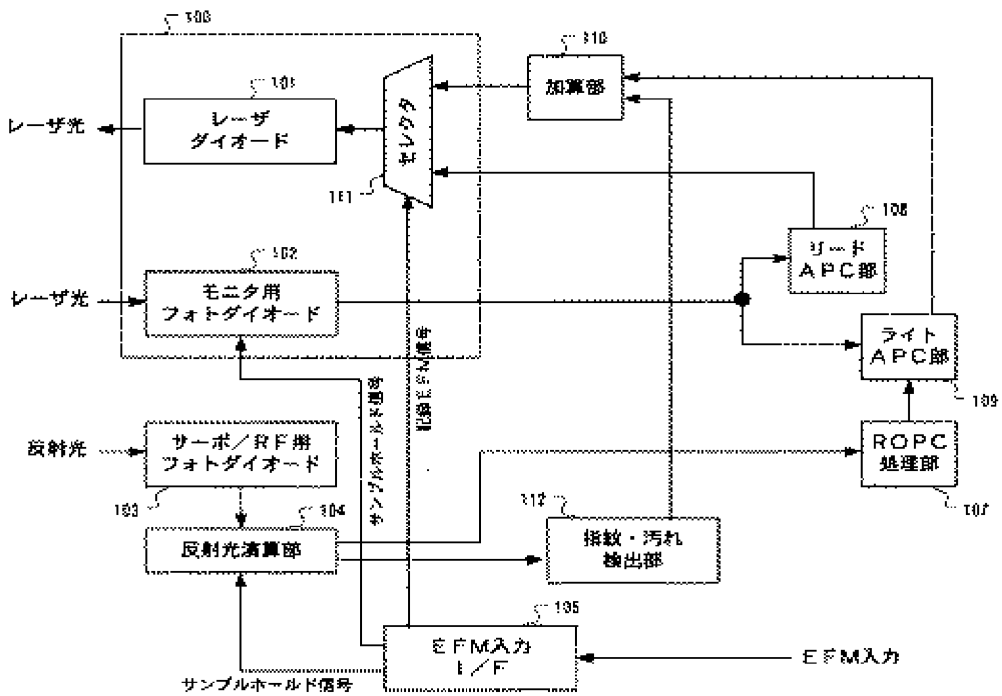
[Drawing 1]



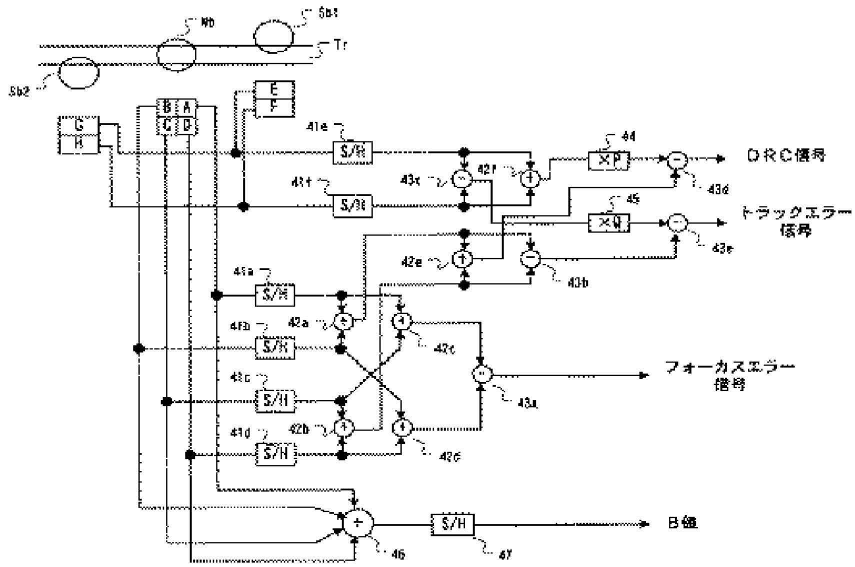
[Drawing 2]


EFM入力
201
EFM幅カウンタ
202
マーク幅記憶部
203
スペース幅記憶部
204
記録EFM
生成部
記録EFM信号
内部EFM信号
205
マークスペース
観測部
内部EFM信号
206
サンプル
ホールド
信号生成部
サンプル
ホールド信号
マークスペース長
選択信号

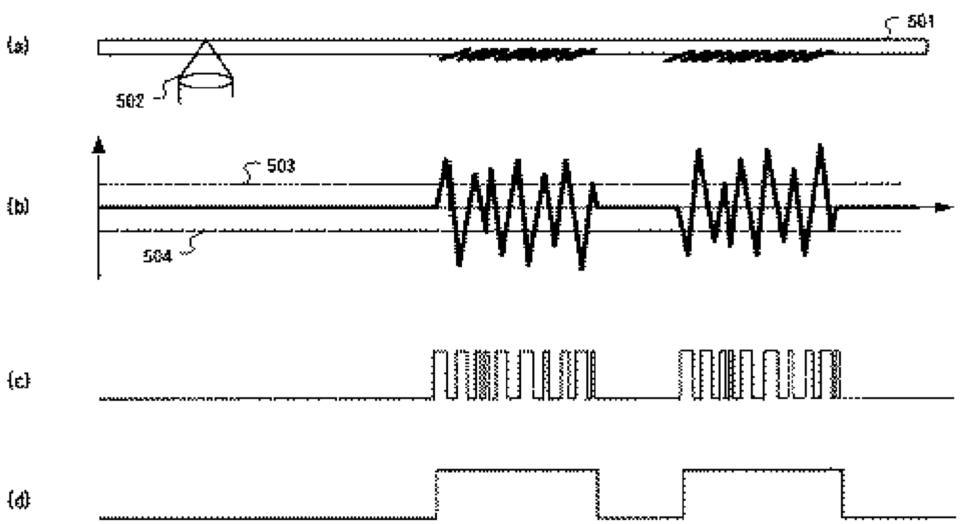
[Drawing 3]


300
310
加算部
101
レーザ
ダイオード
レーザ光
セレクタ
111
108
リード
APC部
102
モニタ用
フォトダイオード
レーザ光
ライト
APC部
109
記録EFM信号
サンプルホールド信号
反射光
サーボ／RF用
フォトダイオード
ROPC
処理部
107
103
104
反射光演算部
112
指紋・汚れ
検出部
105
EFM入力
I／F
EFM入力
サンプルホールド信号

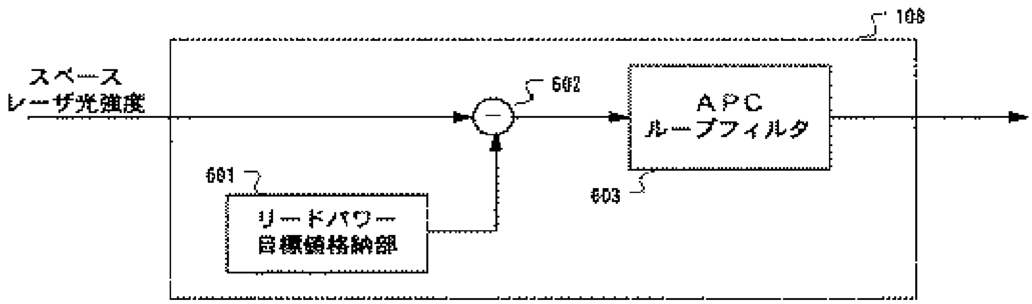
[Drawing 4]



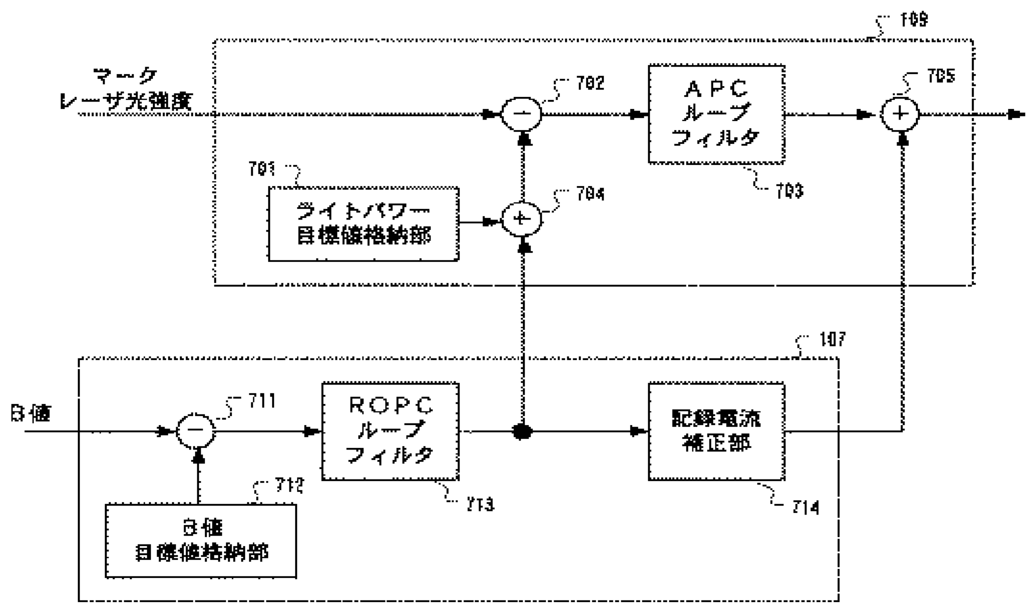
[Drawing 5]



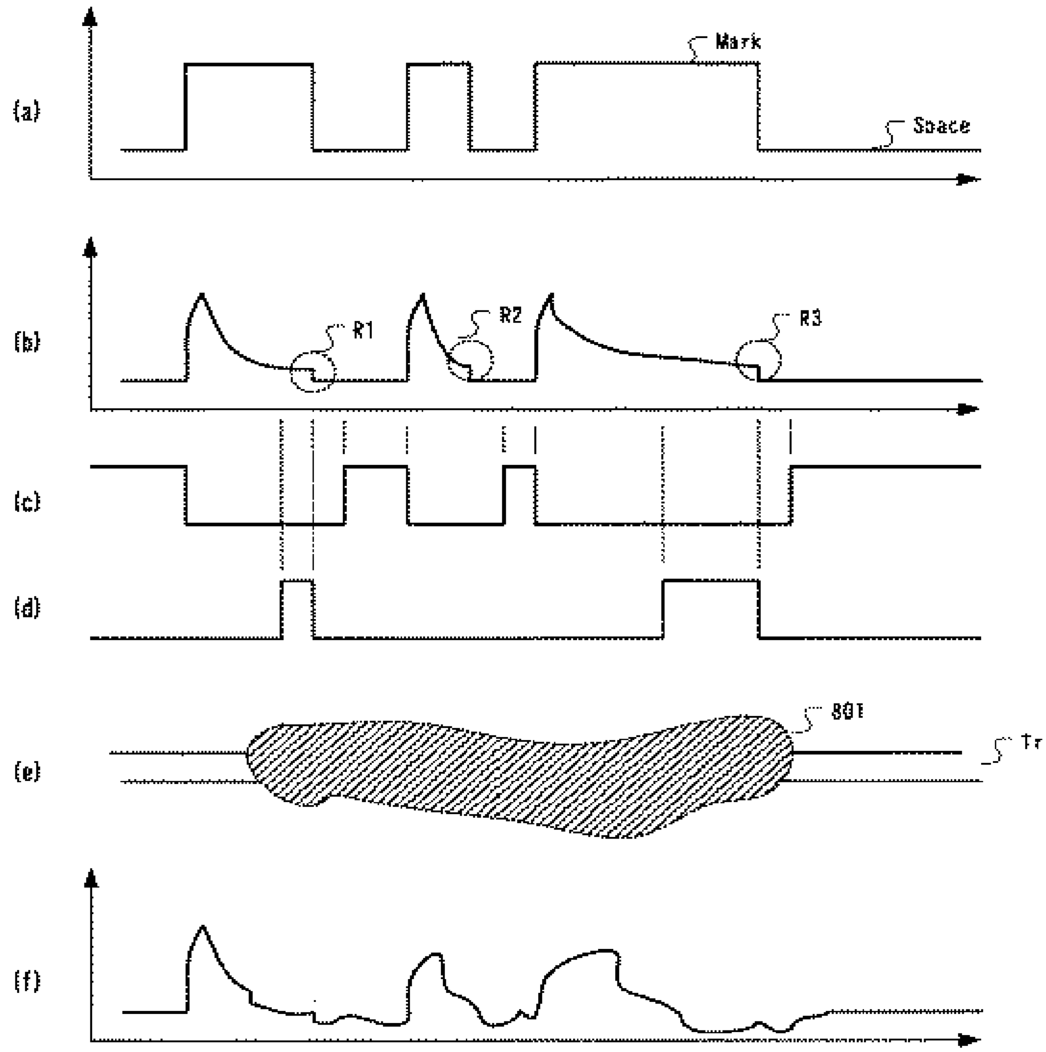
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]